DEVELOPMENT OF A QUANTUM DOT SIMULATOR (QDSIM) FOR RESEARCHING SEMICONDUCTOR NANO-CRYSTALLINE PHOTO DETECTORS AND LASERS. Anthony A. Teate, Dept. of Integrated Science and Technology, James Madison University, 701 Carrier Drive, Harrisonburg, VA 22807. Semiconductor Quantum Dot (QD) nanostructures with dimensions on the order of the thermal DeBroglie wavelength of electrons provide three-dimensional (3-D) quantum confinement of carriers. These nano-crystallites have lead to a recent class of laser sources and photo detectors which are an alternative to the conventional bulk and quantum well devices. An important tool for making progress in the development of these laser sources and detectors is the modeling and simulation of the devices to be realized. This requires the use of good methods that are able to incorporate various physical phenomena present in real devices. In this paper we discuss the details of the development and implementation of a computer software program that provides an interactive environment for studying and researching quantum dot devices. This quantum dot simulator (QDSim) allows one to analyze dynamic characteristics such as relaxation oscillations, modulation and turn-on delay as the injection current increases as well as other characteristics of a real quantum dot laser source. The simulator, which is based on modeling and numerically solving rate equations for InGaAs/GaAs and InAs/InP self-assembled quantum-dot systems using the fourth-order Runge-Kutta algorithm, also permits researching time-resolved photoluminescence and electroluminescence results in quantum dot photo detectors. The computer program and physics presented here are intended as aids for teaching or conducting basic research in the field of quantum confinement optoelectronics.

ANTIOXIDANT CONTENT OF SELECTED WINES FROM VIRGINIA VINEYARDS. Ivy A. Walker, Elise L. Stephenson & Michael H. Renfroe, Dept. of Biol., James Madison Univ., Harrisonburg VA 22801. Moderate wine consumption has been linked to reduced incidence of coronary heart disease, atherosclerosis, thrombosis, myocardial infarction, and slightly increased longevity. These effects have been attributed to the presence of antioxidant molecules including phenolics, flavonoids, and stilbenes, such as resveratrol, in wines. Wines were sampled from six Virginia vineyards extending from Frederick County in the north to Patrick County in the south. The antioxidant activity was measured by using the ABTS/H2O2/HRP decoloration method. Trolox, a well-characterized and stable antioxidant, was used as a comparative standard for wine antioxidants. The highest antioxidant contents were found to be in the red wines with a range of means from 15.38 – 7.42 µmol TE (Trolox equivalents) /ml. Rosé wines ranged from a mean of 4.89 – 3.40 µmol TE/ml. White wines ranged from a mean of 2.64 – 1.62 µmol TE/ml. Many antioxidants such as anthocyanins and resveratrol are particularly concentrated in red and purple grape skins. Red wines which include the skins during processing have the greatest antioxidant concentrations. White wines which are made from green grapes or grapes with the skins removed contain the least antioxidants.

IN SEARCH OF JACKSON BRIAR (SMILAX SMALLII MORONG) IN VIRGINIA. Robert A. S. Wright, EEE Consulting, Inc., 201 Church St. SE, Blacksburg, VA. Jackson Briar has for many years been accepted as a member of the Virginia Flora. All
sources which documented its inclusion into the Virginia Flora were investigated, requiring (1) a literature review which included reaching into the hallowed antiquity of Colonial Period descriptive treatments and specimens for reportedly synonymous taxa; (2) a search of all regional herbaria to locate the extant vouchers from VA, and; (3) a synthesis of the collected data. The results are: (1) the taxon is reported (as S. lanceolata L.) from VA in literature as far back as 1861, but S. smallii = S. lanceolata = S. laurifolia L. per Taxon Vol. 59 (2010); (2) a long-standing misidentification of the voucher that “documented” the taxon in Virginia Beach, VA (from a native habitat) has confused the nativity of the taxon for VA; (3) unrealized “ornamental-planted” habitat at the State Arboretum in Clarke County, VA is (partly) the erroneous basis for inclusion of S. smallii in the recent FNA treatment of Smilax; (4) the taxon’s long-term valid acceptance as a member of the Virginia Flora has no basis, and (5) the ultimate potential habitat where it could be extant in VA is estimated. The final analysis determined that Smilax smallii “could have” historically occurred in VA as reported in literature, but not as represented by a verified extant voucher specimen or a validly corroborated report. However, Smilax smallii could possibly occur along the southern tier of VA. Until such time as it can be found in VA, Jackson Briar should be considered as erroneously attributed to VA on the basis of misidentification of the voucher [= Smilax walteri Pursh].

Pollination experiments, visitor observations, nectar sampling, and pollen-ovule ratio, and pollen size were components of this investigation to determine the pollination biology of Varronia scouleri (Hook. f.) Andersson (Cordiaceae), a distylos Galápagos endemic. Flowers involved in pollination experiments produced fruit via open pollination, “legitimate” cross-pollination (pin x thrum), diurnal pollination, and nocturnal pollination. A significant difference in fruit set was found between flowers that were open pollinated and “legitimately” cross-pollinated (pin x thrum), and those that were self-pollinated. Nocturnal and diurnal fruit set did not differ significantly. Nocturnal visitors included ants, hawk moths, and non-sphingid moths; the main diurnal visitor was the endemic carpenter bee (Xylocopa darwini). Flies were also common diurnal visitors. Insufficient nectar was available for measurement. Based on these preliminary studies, we suggest that Varronia scouleri possesses a strict xenogamous breeding strategy (distyly), which is rare in the Galápagos Islands.

THE FLORA OF VIRGINIA PROJECT: A 2010-2011 UPDATE. Marion B. Lobstein, Dept. of Biology, Northern Virginia C.C., Manassas, VA 22205. Virginia, for its landmass, has the most diversity of vascular plant species of any state in the United States. It had the first flora, the Flora Virginica in 1739, yet does not have a modern flora. The Virginia Academy of Science for over eighty years has supported efforts to produce a modern Flora of Virginia. In 2001 the Foundation of the Flora of Virginia, Inc, was formed in 2001 and in May 2002 received 501(c) 3 status. Work on the content of the Flora of Virginia including the nearly 300 of the core illustrations have been commissioned, completed, and funded by VAS funds. Grants from the Virginia Environmental Endowment, Southern Appalachian Botanical Society, Carrier
Arboretum and Botanical Gardens at JMU have been obtained for the Project during this past year. The Academy, including the Fellows, continues to provide essential support including financial for this Project. Other progress includes completion of treatments of the dichotomous keys to the vascular plant families as well as the species and genus descriptions. A contact has been signed with BRIT (Botanical Research Institute of Texas. The projected publication date is October 2012.

FLOWER MORPHOLOGY POLLINATION SUCCESS AND REPRODUCTIVE SUCCESS IN PASSIFLORA INCARNATA. Jie Ren, Laura F. Galloway & Can Dai, Department of Biology, University of Virginia, Charlottesville VA 22904. Floral morphology affects pollination success and reproductive success in animal-pollinated plants. Floral traits such as flower size and anther length can increase pollination success by affecting pollinator attraction and pollen dispersal efficiency. Similar to among-flower variation, within-flower variation such as different levels of anther exertion has also been shown to influence pollination success. However, within-flower variation in female traits, especially style position, has received less attention. To test the relationship between flower morphology, pollination success and reproductive success, we studied floral traits, especially style deflexion, in Passiflora incarnata. Our results show that lower style deflexion increases both cross-pollination and self-pollination. At the flower level, lower style deflexion is typically less variable and leads to a larger quantity of pollen deposition and seed production. Higher and more variable levels of style deflexion lead to greater variation in pollination and heavier seed weight. In addition, a higher level of style deflexion causes an increased proportion of effective pollination by reducing of self-pollination. These results suggest that style deflexion is genetically controlled to promote pollination success and reproductive success as well as reducing self-pollination.

VASCULAR FLORA OF BANSHEE REEKS NATURE PRESERVE, LOUDOUN COUNTY, VIRGINIA, USA. Lisa D. Williams, Department of Biology, Northern Virginia Community College, Annandale, Virginia 22003. Banshee Reeks Nature Preserve located in the southeastern Goose Creek watershed in the Triassic basin of Loudoun County, Virginia covers 293 hectares and was surveyed for its floristic composition once to twice weekly during the growing seasons of 2002 and 2003. Vascular plants from 90 families, with 211 taxa at the genus level and 281 at the species level, were found and identified. Nineteen species are new records for Loudoun County. Two species – Erigenia bulbosa (Michx.) Nutt. (harbinger-of-spring) and Fraxinus nigra Marsh. (black ash) – are on the state’s watch-list. Data gathered are currently being used as baseline information for land use decisions regarding this natural resource area. (Funding provided by Washington Biologists’ Field Club and the Southern Appalachian Botanical Society. Support provided by George Mason University.)